ECOTAXE a Liability Critical Application
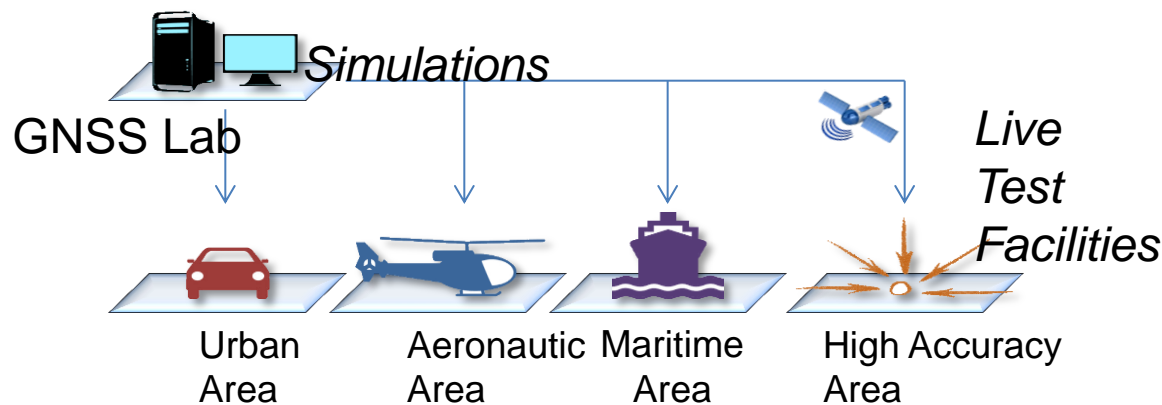
HGV Road Pricing in France

Lessons learnt and recommendations

SUMMARY

1 – ECOTAXE, GNSS based HGV road pricing

2 – Lessons learnt

3 – Recommendations

Simulations

GNSS Lab

Live Test Facilities

Urban Area | Aeronautic Area | Maritime Area | High Accuracy Area

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ECOTAXE – Taxable Network

Ecotaxe is a project stemming from the Grenelle de l'Environment Act.

Public Private Partnership Project

ECOMOUV' : DBFMO SPV (Autostrade per l'Italia, Thales, SNCF, SFR and Steria)

Design, Build, Operation, Financing ,Maintenance. & Operations

- **HGV>3,5 Tons**, for the transport of goods
- **800 000 vehicles** 600000 French + 200000 Foreigners.
- **15,000 km of taxed roads taxed** Highways & National Roads, some local roads
- **Around 4400 Tax points:** **GNSS + GPRS**
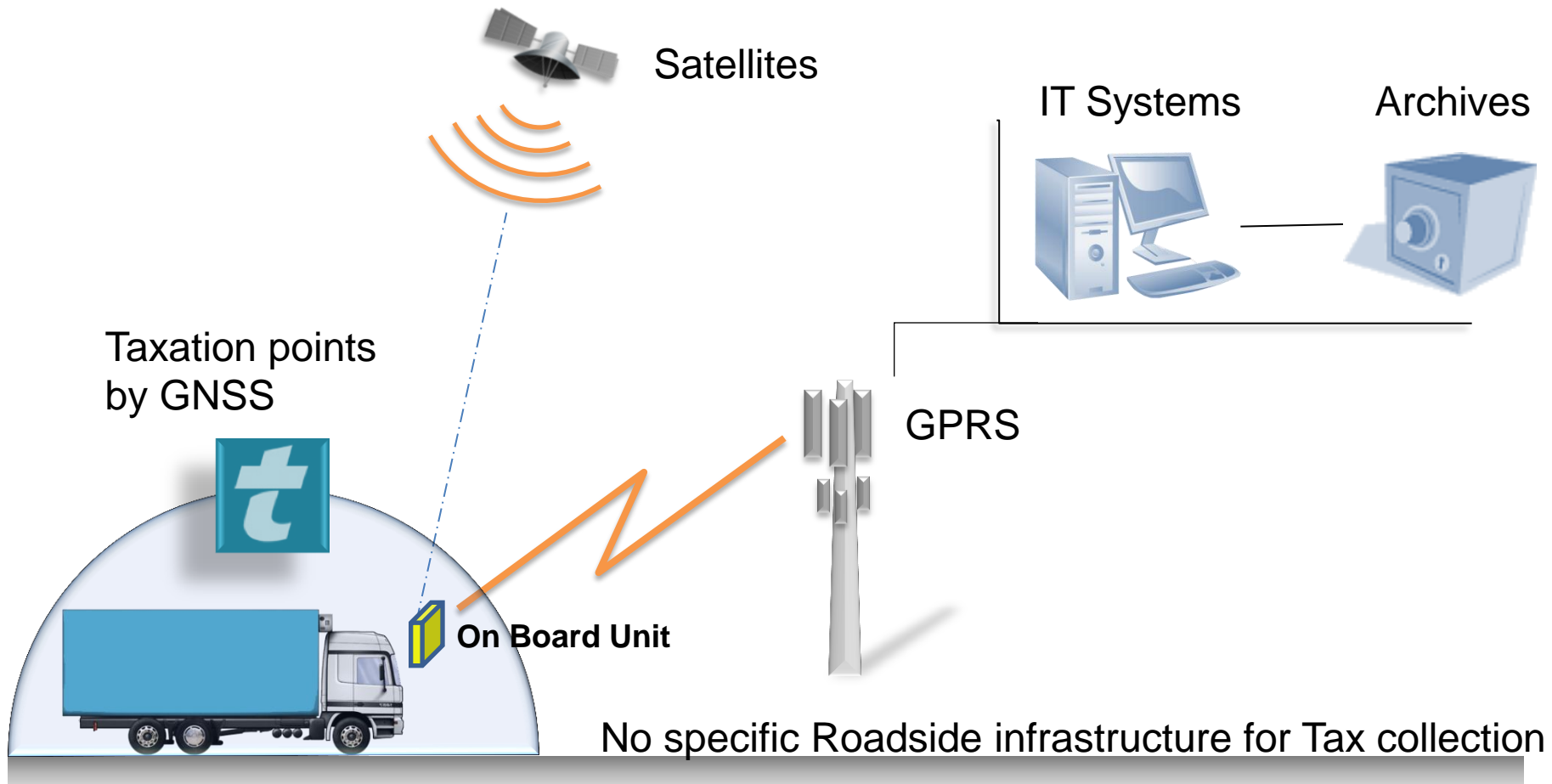- **DSRC for Enforcement**
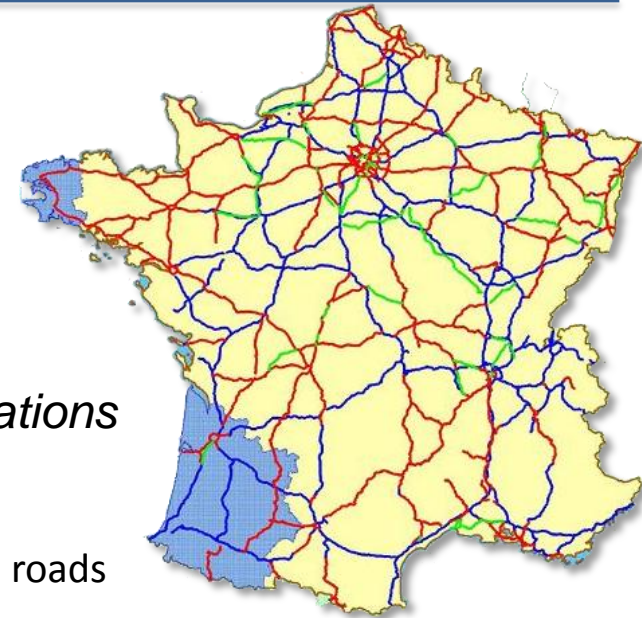
Kick-Off	**National Roll-Out**	**Restitution to the State**
Oct.2010	**Oct.2013**	**2025**

DESIGN & IMPLEMENTATION → **OPERATION & MAINTENANCE (11 years)**

ECOTAXE – GNSS based Road Pricing

Satellites

IT Systems

Archives

Taxation points by GNSS

GPRS

On Board Unit

No specific Roadside infrastructure for Tax collection

•Collect Rate>99.xx%
•False detection rate<10^{-y} (overcharging)

GUIDE accredited as GNSS lab for Ecotaxe Homologation

Risk of false detection

Measured Trajectory 2

Measured Trajectory 1

Real trajectory 1: Taxable Road

Real Trajectory 2: free Road

Risk of low Collecte rate

Lessons learnt (1)

REQUIREMENTS OF LIABILITY CRITICAL APPLICATIONS=> E2E KPIs

❑SAFETY

❑LEGAL

❑ECONOMICS

GNSS Environments

REQUIREMENTS on APPLICATIONS

SPECIFIC MODULES

❑Perf 1 E.g. detection probability of Toll Algorithm

❑Perf 2…

❑Perf 3…

REQUIREMENTS on GNSS ASSETS

❑ACCURACY

❑« INTEGRITY »

❑ AVAILABILITY

Performance Management is a critical task for such applications

Lessons learnt (2)

•**Missing standards to express/compare/test GNSS performances for terrestrial applications.**

•

•**These standards would ease Common understanding on performances between stakeholders** (*system integrators, OBU providers, Toll application developers, Toll service providers,…*)

•**Testing GNSS performances remains complex**

•**Need to setup a Certification/homologation process at EU level**

Some actions already launched to solve above issues:
- Overall Performance management process at CEN/TC5
- Applications E2E KPIs : e.g. CEN TC 278/WG1 for Road Pricing
- GNSS receiver MOPS for terrestrial applications at ETSI TC SES/SCN (SAGITER)
- Regulation for certification/homologation process (Addressed by EC call for tenders ENTR/158/PP/ENT/SAT/12/6411 but allocated effort rather low)

Last 2 initiatives stemming from EC Actions plan on GNSS applications

Preliminary Recommendations

- **Awareness actions should be continued and also include <u>training</u> of all stakeholders involved in GNSS based on GNSS terrestrial applications**
- **Stakeholders feed-back on large scale GNSS based terrestrial applications experience should be seeked**
- **Certification, coordination and standardisation should be continued**
- **GNSS security aspects to be addressed (fraud, spoofing jamming,…)**
- **E112 should be addressed with mandatory localization performances , similarly to US E911 that has boosted localization features in Mobile networks.**
- **Performances should be addressed in multi-constellation cases, as experience proves that the best performances are achieved with multi-constellation receivers.**
- **Galileo Performances experiments should be launched ASAP during the constellation ramp up phase, with combined Galileo + GPS/Glonass configurations**

Thank you !